SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CXLXI.] AUGUST, 1878. [PRICE FOURPENCE or 5s. per ann post free.

## THE JUNE THUNDERSTORMS.

(*Continued from page* 89.)

WE were obliged to conclude our notice of the storms of June 23rd rather abruptly, and we can now only add respecting the Croydon storm a small portion of Mr. Mawley's report:—

"*Summary.*—(1.) This storm after depositing a few drops of rain at one o'clock, came on very suddenly and in full force 36 minutes later, with heavy rain and vivid lightning frequently repeated, and followed in each case almost immediately by thunder. (2.) This thunder had a peculiar loose crackling sound. (3). Between 1.34 and 2.15 the storm-cloud remained very near, and again between 3.35 and 3.50. (4.) The fall of rain was very heavy at times. (5.) Hail of rather large size fell with the rain between 2.36 and 2.40, and unusually large hailstones fell thickly and alone for about four minutes from 3.10. The leaves of many plants were pierced here and there by the hail, and their edges slit by it. Nearly the whole of the leaves of a strawberry bed were much injured, not so much riddled or slit as bruised by the hailstones. These strawberry leaves at the time of writing, July 4th, have not yet recovered and still remain curled up all over the bed. (6.) Between 2.1 and 2.8 no rain at all fell, and again between 4.10 and 4.38. The total between 1.36 and 4.55 p.m. was 1·41 in."

Before proceeding it will be well to summarize the facts previously stated—(1.) A thunderstorm in W. London on 16th. (2.) An excessively heavy rain (max. 3·28 in.), accompanied by much lightning in the north of London about 2 p.m. on 23rd. (3.) A heavy rain (max. 2·22 in.), with lightning and much large hail, slightly west of Croydon, about 2.30 p.m. on the same day.

On the next Sunday, June 30th, a similar heavy storm occurred over the south-east of Hertfordshire, East Essex, and North Middlesex. We cannot enter fully into the details of the damage at Hertford, Hatfield, Ware, Cheshunt and Waltham Cross, but we may select a few statements:—

*Hertford.*—The Essendon Road for some distance on the Hertford

side of the Horns Mill was impassable, and the Lodge at the entrance to Hertingfordbury Park was not only surrounded but nearly two-thirds covered with water. The total damage must be many thousand pounds.

*Ware.*—The line between Hertford and Ware was submerged, though not sufficiently to interrupt traffic. But all along the Great Eastern line the land was so flooded as to resemble a vast lake.

*Hatfield.*—The lower parts of the town were much flooded, the water was three feet deep in the Post Office, and also in the adjoining Public Library, where about 500 volumes were spoiled. A large private house was flooded, five feet of water being measured in the drawing room.

*Cheshunt.*—At Waltham New Town the road was covered by 3 or 4 feet of water, and some houses were not freed from it until Tuesday, July 2nd.

Mr. Clinton Baker, F.M.S., of Bayfordbury, has sent the following details of the fall of rain at his station :—

| | |
|---|---|
| Rain, 11.30 a.m. to 1.45 p.m. (2¼ hours) | = 1·85 in. |
| 2 p.m. to 4.30 p.m. (2½ hours) | = 1·27 in. |
| 4.30 p.m. to 9 a.m. July 1st | = ·56 in. |
| Total in 24 hours | = 3·68 in. |

He has also favoured us with the following extract from a letter by Mr. Mylne, C.E., F.R.S., of Amwell :—

"The appearances indicated a storm working N. from Enfield Chase, and another from Bishop's Stortford working due W., which appeared to meet near Hertford and culminate between Bayford and Hatfield."

Mr. Mylne reports the rainfall to have been—

| | |
|---|---|
| 11.30 a.m. to 1 p.m. / 1.30 p.m. to 5 p.m. | 2·35 in. |
| 5 p.m. to 9 a.m. July 1st | ·37 in. |
| Total in 24 hours | 2·72 in. |

The *Hertfordshire Mercury* gives the following additional values, "Poles, Ware, 2·14 in.," and "Hatfield Park, 2·90 in." It also gave the report of the Surveyor of County Bridges enumerating five damaged bridges, and asking a vote of £500 for their repair.

At Camden Square rain began at 0.38 p.m. on 30th, but was not measureable until 0·43 p.m. ; in the next five minutes 0·16 in. fell : in the next, 0·10 in. ; and in the next, 0·05 ; or 0·31 in. in a quarter-of-an-hour. It continued to rain steadily during the subsequent six hours, so that the total fall was 1·13 in.

At Eltham, 1·32 in. fell in the forty minutes between 2.17 and 2.57 p.m. At Winchmore Hill 0·98 in. fell in thirty-eight minutes between 0·10 and 0·48 p.m., while between 4 and 4.14 p.m.—*i.e.*, in fourteen minutes the enormous amount of 1·08 in. fell ; and by

5.55 p.m. the total fall was 2·31 in. At Enfield, the rain was even heavier, the total being 3·07 in., which the observer reports to be the largest amount he ever measured.

The rainfall was also heavy at the following stations, though by no means as great as in the neighbourhood of Hertford and Enfield:—Ware, Much Hadham, 1·95 in., 1·60 in. of which fell between 3 and 4 p.m.; Upper Clapton, 1·65 in., mostly between 1·50 and 6.30 p.m.; and Hackney, 1·04 in.

## THE PARIS METEOROLOGICAL CONGRESS.

It speaks favourably for the probable success of the above meeting, that many foreigners have already promised to assist. We believe that there are many whose names we have not received, but the following is a very good first-list:—

Agostini, of Modena.
Buys-Ballot, of Utrecht.
Da Schio, of Vicence.
Denza, of Moncalieri.
Hoffmeyer, of Copenhagen.
Ragona, of Modena.
Symons, of London.

Of course, the principal strength will be in the French Meteorologists, and we hear that they will assemble from many of the most distant parts of France, *e.g.*, Crova from Montpellier, and Fines from Tarbes.

## COWL TESTING AT KEW OBSERVATORY.

The influence of the shape and aspect of buildings upon the indications of anemometers placed upon them, has often been insisted upon in these pages. We are inclined to hope that some light will be thrown upon that subject, and also upon the vexed question of discordant results from roof rain-gauges, by experiments now in progress at Kew.

Certain patterns of so-called Suction Cowls—*i.e.*, cowls assumed to possess the power of sucking air up tubes on which they are placed—were exhibited at the meeting of the Sanitary Institute, at Leamington, in 1877. Three of them were referred to a sub-committee for examination and testing, and they, as well as some others, have been under trial at the experimental house at Kew for several months. The details of the experiments have not yet been published, but from what we have heard we think it probable that they will be almost equally valuable to Meteorology and to Sanitary Science. A rough sketch of the arrangements is given in the *Sanitary Register* for July, 1878.

## DIFFERENCE OF RAINFALL WITH ELEVATION.

*To the Editor of the Meteorological Magazine.*

Sir,—The observations by Mr. Dines on the experimental rain gauges fixed on his tower, given in the *British Rainfall* for 1877, are

extremely interesting, and a careful discussion of them will be found to bring out some very remarkable results. In the following table I have supplemented the observations given in the *British Rainfall* by a number of others selected from Mr. Dines' returns (the entire series of which he has kindly placed at my disposal), and have sorted the observations into groups according to the direction of the wind blowing at the time the rain was falling, the last group being those observations when there was practically no wind at all. I have also calculated the ratios of the rainfall in each of the gauges on the tower to the rainfall on the ground, and averaged the ratios for each group.

A mere inspection of the table will shew that though there is considerable irregularity in the ratios, there are certain unmistakeable general features running all through them. Thus, the stronger the wind the less the ratio, the lighter the wind the greater the ratio; in one and the same group one gauge has generally the predominance through all the observations, and in different groups the gauge which has the predominance changes as the direction of the wind changes.

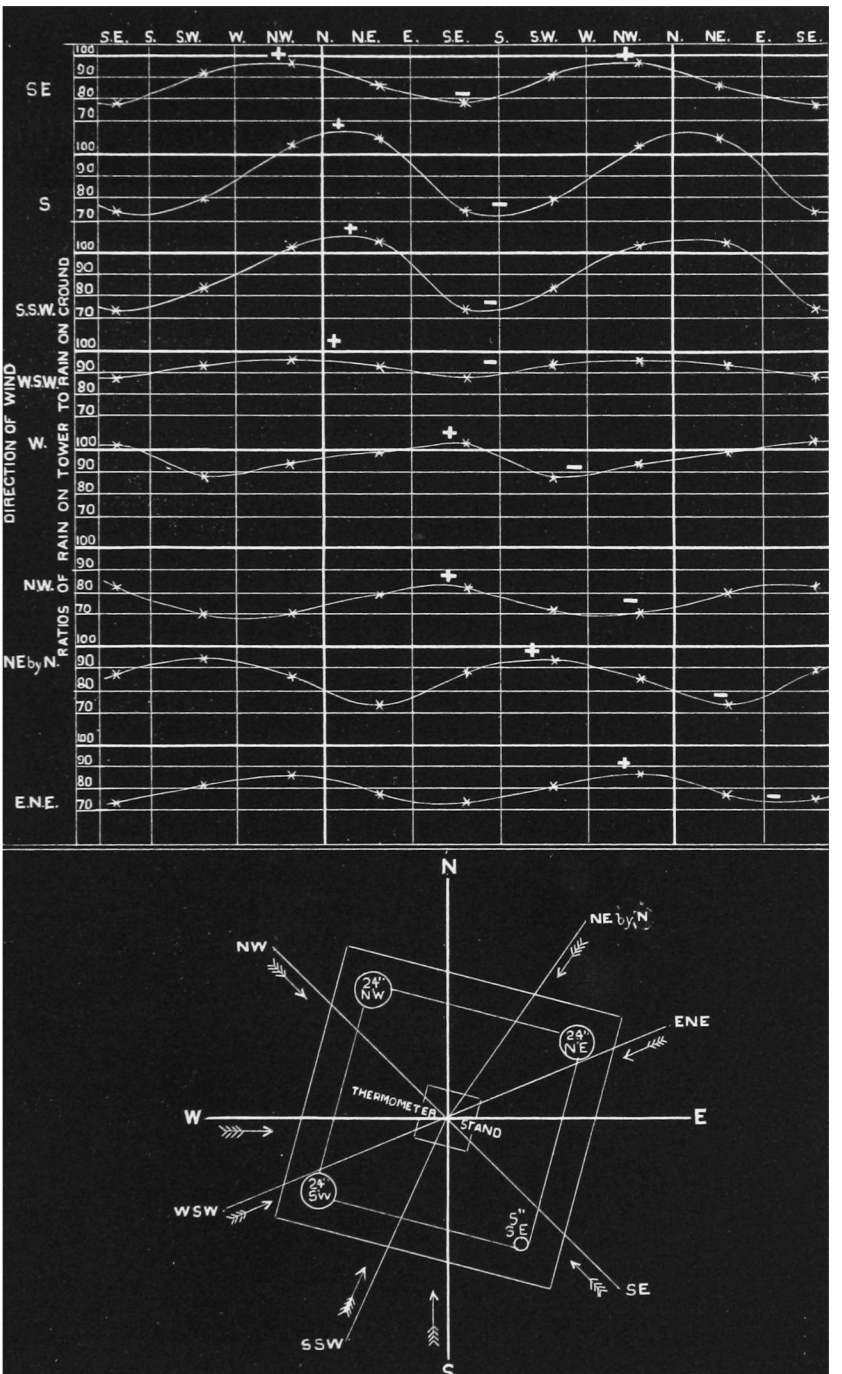
By plotting the average ratios given in the table so as to form curves, as on the annexed diagram, the general features are brought out much more distinctly, and the laws which govern the variation of the ratios elucidated.

The upper diagram shows the varying ratios of the rainfall on the tower to the rainfall on the ground. The horizontal lines represent the ratios, and the vertical lines the cardinal points of the compass to fix the bearing of the different tower gauges. It will be seen that there are eight series of curves corresponding to the eight groups in the table, each curve representing the average ratio of the rainfall on tower to that on ground, with a given direction of wind. The asterisks represent the points of the curve given by observation, *i.e.*, the ratios corresponding to the *different tower gauges* ranged under the proper points of the compass—the asterisks under S.E. referring to the S.E. tower gauge, those under S.W. to the S.W. tower gauge, and so on. The asterisks are repeated so as to prolong each curve beyond its proper length, in order to bring out its form more clearly. The + sign marks the maximum, and the − sign the minimum ratio for each series.

The lower diagram is a plan of the top of the tower, showing the rain gauges. The circles at each corner show the gauges (three 24 in. and one 5 in.), which are called as in Mr. Dines' paper, S.E., S.W., N.W., N.E., though, as it will be seen, the bearing of the corners of the tower differ slightly from true S.E., S.W., N.W., N.E. The lines with arrows represent the eight directions of wind corresponding to the eight curves given above. The centre part of the tower is occupied by a thermometer stand, 3 feet square, rising above the top of the tower, which stand we shall see further on has considerable influence on the results.

On examining the curves we see that each series of ratios has a well defined maximum and minimum, and that the maxima and minima

# DIFFERENCE OF RAINFALL WITH ELEVATION.



have a progression from left to right on the diagram, following the alteration of the direction of the wind; in other words, as the direction of the wind alters from S. through W. to N. the maxima and minima alter likewise from S. through W. to N. It further appears that the minimum ratio is at or near the point where the wind strikes the tower, and the maximum ratio at the opposite point—thus, in the first curve, with the wind at S.E. the minimum ratio is at the S.E. gauge, and the maximum at the N.W. gauge; in the second curve, with the wind due S., the minimum ratio is *between* the S.E. gauge and the S.W. gauge, or about S., and the maximum *between* the N.W. and N.E. gauges, or about N.

The above of itself is, I think, sufficient to prove that the variation in the ratios is due to variation in the direction of the wind, but a little closer examination of the details will show this more clearly still. It will be noticed that in the curves for the S., S.S.W. and W. winds the maximum ratio exceeds 100, but that in all the other curves the maximum is less than 100. On looking at the lower diagram it will be seen that the above three directions of wind are the only ones in which the thermometer stand cannot shelter any of the gauges. With all the other winds this stand more or less shelters the gauge opposite to the point where the wind strikes the tower, and thus reduces the maximum below its normal amount. Moreover, the nearer the direction of the wind to the line of greatest shelter the more the maximum is reduced below 100, as will be seen by comparing the two last curves (N.E. by N. and E.N.E.)

In addition to the disturbance introduced by the sheltering of the thermometer stand, there is also another cause of disturbance, viz., that the S.E. gauge is different from all the others, being 5 inches in diameter instead of 24 inches, and placed with its top 1 foot above the parapet instead of 6 or 7 inches, as in the case of the other gauges. From a comparison of the curves as well as from the other observations given in Mr. Dines' paper, I think there cannot be a doubt that the 5 in. S.E. gauge collects less rain than the other 24 in. gauges, notwithstanding that Mr. Dines has come to the contrary conclusion in his paper.

After making due allowance for the above disturbing causes, and for the uncertainty in many cases as to the precise direction of the wind at the time the rain was falling, I would submit that the preceding discussion of Mr. Dines' observations proves the following points:—

(1). That the ratio of the rainfall on the tower to the rainfall on the ground depends on the force and direction of the wind.

(2). That when there is no wind the amount of rainfall on the tower is about the same as that on the ground.

(3). That when there is wind the amount of rain falling on the tower will vary on different portions of the tower, the portion nearest the point at which the wind strikes the tower receiving less rain than

falls on the ground, and the portion furthest from the point at which the wind strikes the tower receiving the same or more rain than falls on the ground.

(4). That the excess of rain falling on the portion of the tower furthest from where the wind strikes will, to a large extent, compensate the deficiency of rain on the portion nearest to where the wind strikes, but whether to a sufficient extent to make the average amount of rain falling on the tower equal to that falling on the ground, cannot be determined from these experiments.

This letter has already extended to such a length that I am unable to enter into the question of what is the precise action of the wind which reduces the amount of rain falling on one portion of the tower and increases that falling on other portions. I may, however, say that I agree generally with the view expressed by the Rev. F. W. Stow in his able paper in *British Rainfall*, 1871, viz., that the wind is deflected by buildings so as to cause upward and downward currents of air, which distribute the rain unequally. I am hoping shortly to make some experiments on this subject myself for another purpose, which may throw some further light on the matter.

I think it very desirable that Mr. Dines' experiments should be continued, but the thermometer-stand should certainly be removed, and a 24 in. gauge substituted for the 5 in. gauge, at the same level as the other gauges, so as to obviate the disturbing causes already alluded to. Another 24 in. gauge ought to be similarly placed in the centre of the tower (where the thermometer stand now is). I also entirely agree with Mr. Dines that some means should be adopted for determining the force and direction of the wind at the exact time when the rain fell.

I am, Sir, yours obediently,

ROGERS FIELD.

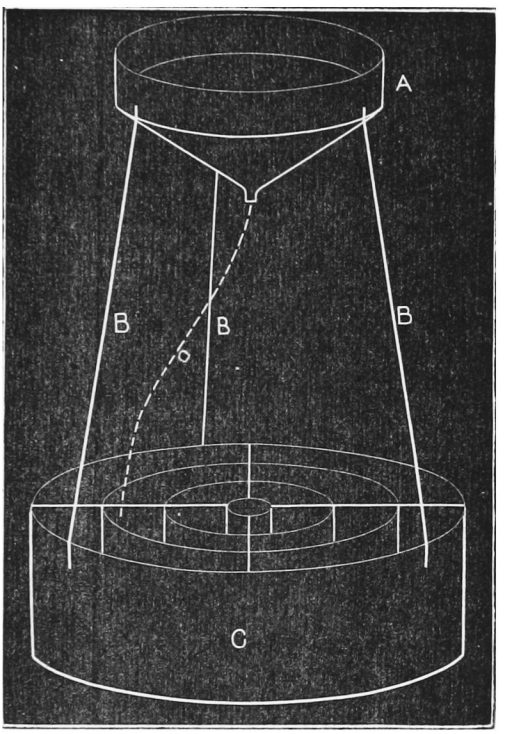
5, *Cannon Row, Westminster, S.W., July*, 1878.

[We think that experiments somewhat resembling those of Mr. Dines's, with four rain gauges at the top of one tower, were tried about twenty years since, either in Denmark or the United States. We have entirely forgotten the results and have but a very dim recollection of the circumstance; any one who can give full particulars will be rendering a service to all students of the subject. With reference to measuring the force and direction of the wind at the exact time when the rain falls, we venture to sketch a very rough plan, which may be better than more costly apparatus, as (1) it will always work when there is rain, (2) it will never work except when there is rain, (3) rain and wind are the only elements concerned. A is a funnel supported by three thin rods B B B, C is a receptacle divided into annular rings, and again subdivided into four quarters. Whenever there is rain it will drip from the bottom of the funnel, vertically into the centre space if there is no wind, and at an angle increasing

*Table accompanying Mr. Rogers Field's Letter on Difference of Rainfall with Elevation.*

| Date. | Direction of Wind. | Force of Wind. | Depth of Rain in inches. | | | | | Ratios. Rain on Ground = 100. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ground Gauge. | S.E. Tower Gauge. | S.W. Tower Gauge. | N.W. Tower Gauge. | N.E. Tower Gauge. | S.E. Tower Gauge. | S.W. Tower Gauge. | N.W. Tower Gauge. | N.E. Tower Gauge. |
| 1878. Jan. 4 | S. to E. | Not much | ·123 | ·089 | ·113 | ·121 | ·105 | 72 | 92 | 98 | 85 |
| May 10 & 11 | E. to S.E. | Not much | ·341 | ·303 | ·330 | ·335 | ·313 | 89 | 97 | 98 | 92 |
| June 14 | E. to E.S.E. | Very light | ·444 | ·346 | ·380 | ·406 | ·359 | 78 | 86 | 91 | 81 |
| MEAN | S.E. | Light | ... | ... | ... | ... | ... | 79 | 92 | 96 | 86 |
| Feb. 13 | S. | Strong | ·072 | ·059 | ·055 | ·078 | ·091 | 82 | 76 | 108 | 126 |
| Feb. 27 | S. to S. by W. | Rather strong | ·198 | ·138 | ·149 | ·198 | ·202 | 69 | 75 | 100 | 102 |
| May 13 | S.S.E. to S.S.W. | Light to fresh | ·296 | ·275 | ·282 | ·302 | ·292 | 93 | 95 | 102 | 99 |
| May 17 | S. | Very strong | ·096 | ·024 | ·044 | ·104 | ·107 | 25 | 46 | 108 | 111 |
| May 22 | S. | Moderate to strong | ·346 | ·328 | ·341 | ·354 | ·344 | 95 | 98 | 102 | 99 |
| MEAN | S. | Strong | ... | ... | ... | ... | ... | 73 | 78 | 104 | 107 |
| 1877. Dec. 28 | S. to S.S.W. | Moderate | ·425 | ·301 | ·349 | ·385 | ·416 | 71 | 82 | 91 | 98 |
| 1878. Jan. 3 & 4 | S. to S.S.W. | Strong | ·203 | ·130 | ·152 | ·212 | ·216 | 64 | 75 | 104 | 106 |
| Jan. 28 | S. to S.S.W. | Strong | ·104 | ·088 | ·098 | ·117 | ·122 | 84 | 94 | 113 | 117 |
| Feb. 28 & March 1 | S.S.W. | Violent | ·134 | ·086 | ·107 | ·131 | ·129 | 64 | 80 | 98 | 96 |
| April 3 | S.S.W. to S.W. | Moderate | ·209 | ·174 | ·188 | ·216 | ·220 | 83 | 90 | 103 | 105 |
| MEAN | S.S.W. | Strong | ... | ... | ... | ... | ... | 73 | 84 | 102 | 104 |
| April 5 | W.S.W. | Not much | ·130 | ·106 | ·116 | ·119 | ·123 | 82 | 89 | 92 | 95 |
| May 26 & 27 | S.W. to S.W. by W. | Moderate | ·248 | ·221 | ·257 | ·241 | ·236 | 89 | 104 | 97 | 95 |
| June 4 | S.W. by W. | Good bit | ·058 | ·050 | ·054 | ·055 | ·054 | 86 | 93 | 95 | 93 |
| June 19 | S.W. to W. | Very light | ·502 | ·451 | ·457 | ·478 | ·441 | 90 | 91 | 95 | 88 |
| MEAN | W.S.W. | Moderate | ... | ... | ... | ... | ... | 87 | 94 | 95 | 93 |
| April 20 | W. | Very light | ·242 | ·232 | ·218 | ·224 | ·229 | 96 | 90 | 93 | 95 |
| June 7 | W. | Slight | ·019 | ·020 | ·016 | ·018 | ·019 | 105 | 84 | 95 | 100 |
| MEAN | W. | Light | ... | ... | ... | ... | ... | 101 | 87 | 94 | 98 |
| Jan. 26 | N.W. | Very piercing | ·027 | ·018 | ·012 | ·011 | ·020 | 67 | 44 | 41 | 74 |
| Jan. 28, 12 to 2 pm | N.W. | Calmed down | ·091 | ·080 | ·071 | ·073 | ·072 | 88 | 78 | 80 | 79 |
| June 16 | N.W. | Scarcely any | ·157 | ·141 | ·137 | ·140 | ·130 | 90 | 87 | 89 | 83 |
| MEAN | N.W. | Light | ... | ... | ... | ... | ... | 82 | 70 | 70 | 79 |
| Feb. 11 | N.E. | Very little | ·049 | ·045 | ·049 | ·046 | ·043 | 92 | 100 | 94 | 88 |
| May 29 | N.N.E. | Blustering | ·053 | ·048 | ·049 | ·042 | ·039 | 90 | 93 | 79 | 74 |
| June 30 | N.N.E. | Violent | ·436 | ·368 | ·378 | ·368 | ·246 | 84 | 87 | 84 | 56 |
| MEAN | N.E. by N. | Strong | ... | ... | ... | ... | ... | 89 | 93 | 86 | 73 |
| Jan. 5 | E. to E.N.E. | Moderate | ·082 | ·060 | ·073 | ·079 | ·069 | 73 | 89 | 96 | 84 |
| April 10 | E.N.E. | Strong to moderate | 1·359 | ·984 | 1·103 | 1·170 | 1·004 | 72 | 81 | 86 | 74 |
| April 24 | N.E. by E. | Light | ·078 | ·059 | ·057 | ·059 | ·055 | 77 | 73 | 77 | 70 |
| MEAN | E.N.E. | Moderate | .. | ... | ... | ... | ... | 74 | 81 | 86 | 76 |
| Feb. 9 | ... | Really none | ·054 | ·054 | ·061 | ·066 | ·066 | 100 | 113 | 122 | 122 |
| Feb. 10 | S. to S.E. | Very little | ·015 | ·012 | ·019 | ·019 | ·020 | 80 | 127 | 127 | 133 |
| April 16 | S. to E. | Scarcely any | ·057 | ·048 | ·056 | ·059 | ·055 | 84 | 98 | 104 | 96 |
| April 20 | S.W. to W. | Scarcely any | ·216 | ·230 | ·232 | ·234 | ·233 | 106 | 107 | 108 | 108 |
| June 5 | N. to W. | Practically none | ·061 | ·061 | ·063 | ·063 | ·061 | 100 | 103 | 103 | 100 |
| MEAN | | Calm | ... | ... | ... | ... | ... | 94 | 110 | 113 | 112 |

with the force of the wind, and, of course, into the compartment furthest from the direction whence the wind is coming.—ED.]




## THUNDERSTORM AND WHIRLWIND.

*To the Editor of the Meteorological Magazine.*

SIR,—During the second thundery period experienced this summer we were favoured in this district with a fair, but not, as in the first period, with an undue share of thunder and hail storms. Only one of these was sufficiently remarkable to prove of interest to your readers.

The morning of June 26th was totally cloudless, but about noon a few fragmentary high cumuli began to be scattered over the sky, travelling from S. by W., from which quarter there was a very hot dry breeze. About 1 p.m. the cumuli rose to a large size in the W., and continued steadily to increase. At 3 p m. it began to thunder in the W. (distant), in which quarter a large nimbus had formed. This storm was accompanied, as I am informed, by a very strong gusty wind at Worcester and Birmingham, where it was felt rather heavily. At this place the breeze at that hour had died down; cumulus travelled slowly from S., and cirrus, which began to be visible above, from N.N.E.

At 4 p.m. a large cumulus slowly formed about three miles to the

S. of this place, beyond which a new range of nimbus was visible. This cumulus became steadily larger and darker, and when nearly overhead emitted some flashes of lightning. A very loud roaring sound could now be heard in the cloud, and at 4.25 it began to hail very heavily. The wind suddenly rose and went twice completely round the compass in about ten minutes, blowing, especially from the S., with extreme violence, and scattering branches of trees all over the meadows. The tornado was accompanied by a deluge of rain and hail. At 4.50 the nimbus had passed off to the N., and had apparently become less intense. At 5 p.m. the sun shone out, and we had a dead calm. At that hour it was thundering incessantly in S.E. and S., and this fresh storm was accompanied in the neighbourhood of Rugby (as appears from a cutting from the *Midland Times*, which I enclose) by a tornado similar to that which we had experienced.

The last mentioned storm passed over this place attended by a strong S.S.W. gust and some vivid lightning, at 5.40. After this we had a steady breeze from E. throughout the evening, with rain and occasional thunder in the E and N.E. The barometer was very steady and high during the storms.—Yours truly,

W. CLEMENT LEY.

*Ashby Parva Rectory, Lutterworth, July 12th*, 1878.

## LONG LAWFORD.

THUNDERSTORM.—About five o'clock on Wednesday afternoon this village and neighbourhood were visited by a storm of a most alarming nature, such as had never been witnessed by the "oldest inhabitant." The day had been extremely hot, and towards the afternoon dark clouds appeared in the horizon; about five o'clock a few drops of rain began to fall, and suddenly without any futher warning, the storm burst in all its fury, the wind blowing a hurricane, the rain falling in a perfect deluge, and to add to the terrors of the scene the lightning was awfully grand, followed by loud and crashing peals of thunder. Branches of trees were torn off and whirled about in all directions, many large trees that had withstood scores of previous storms were torn up by the roots, and people were in fear lest their houses should also be demolished. Many gardens suffered severely, fruit trees being broken, and the peas, beans and potatoes being laid flat by the terrific force of the wind and the weight of the falling water. During the storm hail stones of large size fell, and broke several windows. Persons working in the hay-fields were exposed to the full fury of the elements and dare not run beneath the trees for shelter as they were being blown down in all directions, and many hair-breadth escapes are reported. A cow belonging to Mr. Burnham was so much injured that it had to be killed, but this is the only injury to life or limb that we have heard of, although the damage to property was very great. Scores of trees were blown down, and hundreds more or less injured. Near to Holbrook Grange, no fewer than 16 large trees were uprooted, to say nothing of smaller ones, and others dismembered of many of their branches, the plantations suffering severely, and the damage here is estimated at not less than £100. At Mr. Spokes's, at Little Lawford, several windows were broken and other damage was done. The storm appears to have been limited in extent, as it did not reach so far as Dunchurch station, and at Bretford but little rain fell, but we are informed that a chimney of a house there was struck by lightning. The electric fluid also struck two trees near to Brinklow. The storm, which lasted about half-an-hour, will be long remembered, and in some places its disastrous effects will be visible for years to come.—*Midland Times.*

## LARGE HAIL.

*To the Editor of the Meteorological Magazine.*

SIR,—I fear that there is no good record of the below mentioned storm at Newport, Isle of Wight, which occurrence I well remember. I have a strong idea that my father measured a hail-stone *nine inches* in circumference. The following is from the *Hants Independent* of August 25th, 1855 :—

"The most terrific storm we ever witnessed broke over the town and suburbs on Thursday night (23rd), shortly after 11 o'clock, when the elements pelted down upon us for nearly half-an-hour pieces of jagged ice measuring from 3 to 7 inches in circumference, and fully as large as hens' eggs; the consequence of which is that scarcely a house within the scope of the tempest has escaped injury either to its glazing or covering; and the garden crops of fruit, vegetables, and flowers, are beaten into the earth in one universal ruin; the birds at roost in the trees were killed by hundreds; plates of glass ¼-of-an-inch in thickness were shivered in the storm, as if they were but egg shells; and in some conservatories, not a single pane or plant remains entire. In short, such devastation, and such a complete destruction of property, were never before witnessed, even by the 'oldest inhabitant.'"

In this year of thunderstorms, I am induced to send you the above, as I do not remember anything approaching to it for grandeur, or for the amount of destruction caused. I *believe* even sheep were killed by the hail; and I *think* my father stated that it drifted like snow into heaps 12 or 18 inches deep. The hail, of course, was of all sizes. At Ventnor there was no measurable quantity of rain.—Sincerely yours,

E. G. ALDRIDGE.

*3rd July*, 1878.

## YET ANOTHER HEAVY RAIN.

*To the Editor of the "Times."*

SIR,—In six years out of the last 20 there was no day on which the fall of rain amounted to one inch. During the 20 years 1858 to 1877 the rainfall

| | | | |
|---|---|---|---|
| On 21 days exceeded | 1·00 in. | On 4 days exceeded | 1·50 in. |
| On 11 days exceeded | 1·10 ,, | On 3 days exceeded | 1·60 ,, |
| On 9 days exceeded | 1·20 ,, | On 1 day exceeded | 1·70 ,, |
| On 6 days exceeded | 1·30 ,, | On 1 day exceeded | 1·80 ,, |
| On 5 days exceeded | 1·40 ,, | | |

And 1·82 in. on July 25th, 1867, was the largest fall in a true rainfall day.

The number and largeness of the heavy falls in 1878 were not only unusual when I last addressed you, but they were beyond all precedent, and now another has to be added to the list. I accidentally omitted to quote one in my last letter, and therefore now give the full series for 1878, which is as follows:—April 10th, 2·56 in. (this was the fall in the rainfall day, the total was 3·23 in.); May 7th, 1·71 in.; June 23rd, 3·28 in. (the whole of this fell in one hour and a half); June 30th, 1·13 in. (this fell in six hours); August 3rd, 1·41 in. Comparing these five falls in the one year 1878 with the above table for 1858–77, it will be seen that in the present year we have had two days each with larger falls than any day for 20 years, one day (May 7th) which has only been ex-

ceeded once in 20 years, another (August 3rd) which has had but five precedents in 20 years, and even the least (June 30th) has only been exceeded ten times in that period. Both in quantity and frequency the falls in 1878 are far beyond any precedent at this station.

The fall of August 3rd was chiefly produced by two storms. The first began at 10·25 a.m. on the 3rd, rapidly became heavy, yielded 0·32 in. by 11 a.m., and 0·44 in. by noon, when it ceased. Some short showers afterwards brought the fall up to 0·53 in. At night lightning was seen from 11.30 p.m., and thunder heard shortly after midnight. Rain began about 0.30 a.m. on the 4th, and by 0.45 was very heavy; by 1 a.m. a quarter of an inch had fallen, and by 1.25 a second quarter of an inch; it then rained less heavily, only 0·09 in. falling in the next half hour; the fall after 2 a.m. was 0·29 inch. The night storm therefore gave 0·88 in., which added to the day fall of 0·53 in., gives the large total of 1·41 in. for the 24 hours.

I have not yet received particulars of the fall at other stations, but I think it very probable that others felt this storm more than we did here.

I am, Sir, your obedient servant,

62, *Camden Square, N. W.* G. J. SYMONS.

P.S.—There was almost constant thunder on the 4th from 1 to 3 p.m., from 4.13 to 6.38 p.m., and about 7.40 p.m., and a few sharp showers, especially one which gave 0·13 in. between 6.32 and 6.34.30 p.m., *i.e.*, in 2½ minutes.

## HEAVY RAINS AT HITCHEN SINCE 1851.

*To the Editor of the Meteorological Magazine.*

SIR,—I see you were up and doing last night. I send you all our records of heavy rain (1·00 in. and more) that have fallen since June 1849. As a rule July is the month (shown in table in black figures.) The rainfall of 1857 was curious.

| | in. | | in. | | in. |
|---|---|---|---|---|---|
| 1852...Jan. 13 | 1·10 | 1857...Oct. 23 | 3·09 | 1865...Oct. 23 | 1·25 |
| ,, ... ,, 14 | 1·02 | ,, ...Nov. 4 | 1·18 | 1867...May 10 | 1·13 |
| ,, ...May 27 | 1·00 | 1858...April 9 | 1·16 | 1868...Aug. 19 | 2·22 |
| ,, ...June 10 | 1·00 | ,, ...July 11 | **1·08** | 1871...July 10 | 1·15 |
| ,, ...July 14 | **1·09** | ,, ...Aug. 15 | 1·48 | ,, ...Sept. 29 | 1·38 |
| ,, ...Oct. 5 | 1·00 | 1859...July 30 | **1·08** | 1873...July 13 | **1·24** |
| 1853...July 14 | **1·82** | 1860...May 13 | 1·40 | 1874... ,, 10 | **1·62** |
| 1855... ,, 12 | **1·31** | ,, ...June 3 | 1·14 | 1875... ,, 3 | **2·06** |
| 1856...Sept. 2 | 1·08 | ,, ...Sept. 25 | 1·40 | 1876...Sept. 5 | 1·12 |
| 1857...June 20 | 1·00 | 1861...Nov. 14 | 1·33 | ,, ...Dec. 23 | 1·05 |
| ,, ...July 28 | **1·22** | 1864...Mar. 1 | 1·04 | 1877...Sept. 3 | 1·04 |
| ,, ...Aug. 6 | 1·15 | 1865...July 7 | **1·42** | ,, ...Nov. 11 | 1·31 |
| ,, ... ,, 14 | 1·32 | ,, ... ,, 10 | **1·05** | 1878...May 7 | 1·05 |
| ,, ... ,, 15 | 1·31 | ,, ...Aug. 24 | 1·35 | ...Aug. 4 | 1·13 |
| ,, ...Oct. 9 | 1·08 | ,, ...Oct. 17 | 1·68 | | |

A furious thunderstorm took place here yesterday (August 4th) at 7 p.m. In less than 10 minutes we registered 0·66 in.; the remainder (0·47 in.) fell between 9 and 10 p.m. During the 10 minutes the thermometer fell nearly 7°, and the lawn was white with hail. At Orton Head they had only 0·92 in.; the storm came from the S.E., and followed a storm that just missed us by a mile travelling in the same direction. These falls are so local that whilst Stevenage (4 miles off), on Saturday was swimming with water, half-a-mile out of the village, they had not had a drop.—Yours truly,

W. LUCAS.

*Hitchen, August 5th*, 1878.

## RAINFALL IN JULY.

*To the Editor of the Meteorological Magazine.*

SIR,—Thinking you may be somewhat interested in the very small rainfall here during the month of July, I have copied it from my weather book. The total fall is only ·04 in. for the whole month, ·03 in fell on the 22nd, and ·01 in. on the 23rd. There were other times when a drop or so of rain fell, but not sufficient for observation in the rain gauge.

The above is the smallest amount of rainfall that I have recorded since I have kept a register, now upwards of twenty years. I find in September, 1865, I have registered only ·18 in. for that month, when the weather was remarkably fine, and 21 cloudless days.

We have rain to-day (·16 in.). I ought to say that on the 30th June this year we had the skirt of a heavy shower (say ·18 in.), but within a mile from here I should think three times that quantity fell. The rainfall on the 23rd June here was only ·03 in., when you registered upwards of 2 inches at Camden Town.—Yours truly,

S. TABOR.

*Fennes, near Braintree, 3rd August*, 1878.

---

## WHIRLWIND IN CORNWALL, JUNE 9TH.

SINGULAR STORM.—A storm of an extraordinary character visited a part of Cornwall early on Sunday morning. At Golant, near Fowey, the storm was accompanied by heavy rain. Houses were unroofed, some of the slate stones being carried a distance of 500 yards. In one orchard 20 or 30 apple trees were blown down, in another 15, and several others have been more or less damaged. In Penquite Wood, the property of Mr. West, of St. Blazey, there are 10 large oak trees rooted out of the ground, some of the limbs falling across the Lostwithiel and Fowey Railway. Telegraph wires were carried away, and some of the posts stuck four or five feet in the mud. Branches of trees were floating all over the river. The wind was so strong that it blew down about 300 feet of the new wood railing by the side of the line. The most remarkable incident, however, occurred to a large boat, 2½ tons burthen. This boat, which was lying in an upright position on her keel on the beach, was turned over bottom upwards and carried a distance of 12 feet, breaking in her starboard quarter. The storm, which lasted only about five minutes, came from the south-west, and seems to have been confined to a small space, as some houses quite close to those damaged received no injury at all. Such a wreck of property has never before been witnessed in the village. It is a miracle no lives were lost, as a great many trees fell near dwelling houses. The storm appears to have been confined to the Fowey River and its neighbourhood. At Lerryn, Couched Mill, about three miles from Lostwithiel, up the River Fowey, the mischief done was considerable. The little village is surrounded with orchards, and upwards of 300 apple trees were uprooted. Large oak, elm, and other trees, were also uprooted. The damage done to house property was also great, houses being entirely stripped of their roofs, and chimneys being blown down, but, happily, no one was injured. In the little village of Couched Mill, about one mile from Lerryn, it also raged with great fury, doing considerable damage to the orchards and house property. Mr. Isabell, who owns a large mill, at Couched Mill, was awake at the time, and says that he heard something coming up the valley roaring like a heavy peal of thunder. He got up

and looked out of the window, and for about three minutes, he says, the lightning was awful. He saw wood which he had stacked blowing about as if it was paper. Some pieces which had been cut for barrel staves were afterwards found more than a mile away, at which distance they broke the window of a farmhouse. The storm was very remarkable, for it only seems to have been about 20 yards wide, and lasted but three or four minutes.

## SUPPLEMENTARY TABLE OF RAINFALL IN JULY, 1878.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see Met. Mag., Vol. X., p. 28., but the list is under revision.]

| Div. | Station. | Total Rain. | Div. | Station. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Acol | ·65 | XI. | Solva | 3·80 |
| ,, | Littlehampton | ·49 | ,, | Castle Malgwyn | 2·39 |
| ,, | Hailsham | ·83 | ,, | Nantgwilt, Rhayader | 1·36 |
| ,, | St. Lawrence, I. of W. | 3·54 | ,, | Carno | ·58 |
| ,, | Strathfield Turgiss | ·88 | ,, | Rhug, Corwen | ·79 |
| III. | Addington Manor | ·86 | ,, | Port Madoc | ·62 |
| ,, | Oxford | 1·17 | XII. | Carsphairn | ·45 |
| ,, | Northampton | ·45 | ,, | Melrose | 1·03 |
| ,, | Cambridge | ·97 | XV. | Gruinart | 1·09 |
| IV | Sheering | 2·05 | XVI. | Grandtully | ... |
| ,, | Diss | 1·67 | XVII. | Tomintoul | 1·14 |
| ,, | Swaffham | .. | ,, | Keith | 2·04 |
| V. | Alderbury, Salisbury | 1·79 | XVIII. | Dalwhinnie | 1·15 |
| ,, | Compton Bassett | 2·82 | ,, | Auchnasheen | 3·00 |
| ,, | Dartmoor | 2·41 | ,, | Springfield, Tain | 1·25 |
| ,, | Teignmouth | 1·54 | ,, | Glenfinnan | 4·62 |
| ,, | Langtree, Torrington | 1·92 | XIX. | Watten | 2·44 |
| ,, | Cosgarne, St. Austell | 1·55 | XX. | Glenville, Fermoy | 2·82 |
| ,, | Taunton | 2·76 | ,, | Tralee | ... |
| VI. | Bristol | 2·89 | ,, | Tipperary | 1·84 |
| ,, | Sansaw | ... | ,, | Newcastle W., Limerick | 2·25 |
| ,, | Cheadle | 1·76 | ,, | Kilrush | ·78 |
| ,, | Bickenhill Vicarage | .. | XXI. | Kilkenny | ... |
| VII. | Coston, Melton Mowbray | 1·43 | ,, | Kilsallaghan | 1·00 |
| ,, | Bucknall | 1·50 | ,, | Twyford, Athlone | 2·03 |
| VIII. | Walton, Liverpool | 1·05 | ,, | Belvedere, Mullingar | 1·88 |
| ,, | Broughton-in-Furness | ·73 | XXII. | Ballinasloe | ... |
| IX. | Stanley, Wakefield | 1·01 | ,, | Kylemore | 2·23 |
| ,, | Mickley, Ripon | ·66 | ,, | Carrick on Shannon | 1·98 |
| ,, | Whitby | ... | XXIII. | Rockcorry | ·92 |
| X. | Gainford | ·49 | ,, | Warrenpoint | ·50 |
| ,, | Unthank Hall | 1·70 | ,, | Newtownards | 1·13 |
| ,, | Shap | ·73 | ,, | Bushmills | 1·46 |
| IX. | Llanfrechfa | 1·35 | ,, | Buncrana | ·47 |

# THE WEATHER IN JULY.

THE weather at the beginning of July was much more unsettled than during the last week of June. Pressure from the 1st to the 4th was lowest to the eastward and southward of our Islands, so that N. and N.E. breezes prevailed, bringing cloudy skies and cold weather to all coasts; the thermometric maxima on the 3rd being as much as 30° lower than those on the previous Wednesday. From the 4th to the 7th the highest readings of the barometer were found over France, and depressions passed from W. to E. to the northward of our Islands, occasioning first south-westerly, then westerly, and finally north-westerly breezes.

During the second week quiet, cool and cloudy weather was experienced. Showers of rain fell in several places on the 7th, 9th and 10th, and a good deal of rain over our south-western counties on the night of the 12th, but otherwise the weather was dry generally. The barometer was generally highest to the S.W. of our Islands, and lowest in the north. Various shallow depressions passed across in the extreme north, especially on the 9th and 10th, and a very small one passed in a south-easterly direction near the S.W. of Ireland on the 12th, and at 8 a.m. on the 13th it was off the mouth of the Channel.

After the 13th the weather underwent a very marked and favourable change, from the comparatively cool and cloudy period above to one of brilliant sunshiny weather, with very high temperatures and no rain. The hottest day of all was Friday, the 19th, on which occasion the thermometer rose to 91° in the shade at Nottingham, to 88° in London, and to between 91° and 100° in the west of France. On the 17th the barometer began to fall in the S.—a fall which on the following days became nearly general, and at the close of the third week it appeared that the fine weather had begun to break up throughout the greater part of Western Europe. Severe thunderstorms occurred in the S.W. and S. of our Islands, with a singular absence of rain.

On the 23rd the reports showed the weather to be in a very changeable state. The barometer had risen rather briskly in the Shetlands and W. of Norway. Local irregularities in pressure were noticeable in many places, indicating unsettled thundery weather. The next day pressure was increasing briskly in Sweden, and recovering somewhat on our S.W. coasts, but was decreasing elsewhere. This changeable weather continued on the 25th and following days to the 28th. On the 25th the distribution of pressure was somewhat peculiar. Low readings prevailed to the north-westward of our Islands, from which region a band of low pressure extended south-eastwards over Great Britain. In this band the barometer varied from 29·62 in. to 29·69 in., whilst over the Bay of Biscay readings as high as 30·00 in. were reported, and 29·85 in. over Norway and Denmark. Local irregularities were still prevalent. Thunderstorms and heavy rain occurred in many parts of England and Ireland. The largest falls reported are 2·2 in. at Nottingham, 0·9 in. at Donaghadee, 0·8 in. at Liverpool, and 0·7 in. at Oxford. The maximum temperatures on this day in England varied from 70° to 75°.

On the 28th the weather again became fine in the S.E. and N.W., and also in Sweden, but was cloudy in all other parts of Western Europe. Heavy rain was reported from York, Valencia and Roche's Point, and thunderstorms from Nottingham and Dover. On the 30th pressure was increasing over the whole of Western Europe, most on our north-east coasts. The next day, however, a decrease was reported both from Toulon and the Baltic, but in all other places it was rising. A large anticyclone (30·30 in. and upwards) lay over the British Isles, whence readings decreased to 30·00 in. at Wisby and 29·86 in. at Toulon. The weather was exceedingly fine over Sweden, Denmark, the whole of the western and northern parts of our Islands and the greater part of France, but over the Netherlands and the east and south-east of England the sky was overcast and, in some places, gloomy. No heavy rain was reported, and the sea was smooth throughout Western Europe.

H. E. M.

# JULY, 1878.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date. | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Town | ·64 | — 1·15 | ·28 | 24 | 7 | 86·2 | 19 | 43·5 | 4 | 0 | 0 |
| II. | | Maidstone (Hunton Court) | 1·74 | + ·10 | ·63 | 27 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Selborne (The Wakes) | 2·40 | + ·20 | ·51 | 23 | 8 | 80·0 | 20 | 41·5 | 4 | 0 | 0 |
| III. | | Hitchen | 1·20 | — ·70 | ·36 | 24 | 8 | 79·0 | 19 | 42·0 | 3 | 0 | ... |
| ,, | | Banbury | 1·51 | — ·55 | 1·06 | 24 | 10 | 83·0 | 19§ | 45·0 | 30 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·69 | — 1·30 | ·39 | 24 | 8 | 87·0 | 19 | 37·0 | 3 | 0 | 0 |
| ,, | | Norwich (Sprowston) | ·53 | ... | ·22 | 29 | 7 | ... | ... | ... | ... | ... | ... |
| V. | | Bridport | 1·96 | — ·15 | ·64 | 12 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·70 | — 1·16 | ·79 | 12 | 11 | 87·0 | 20 | 53·0 | 31 | 0 | ... |
| ,, | | Bodmin | 1·96 | — 1·15 | ·67 | 12 | 11 | 83·0 | 19 | 51·0 | 1 | 0 | 0 |
| VI. | | Cirencester | ·92 | — 1·52 | ·38 | 24 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 1·30 | — ·87 | 1·07 | 24 | 7 | 79·0 | 20* | 45·0 | 4 | 0 | 0 |
| ,, | | Tenbury (Orleton) | 2·16 | — ·22 | 1·47 | 24 | 8 | 85·7 | 17 | 41·2 | 4 | 0 | 0 |
| VII. | | Leicester (Town Museum) | 2·04 | ... | 1·21 | 24 | 8 | 84·0 | 21 | 42·9 | 4 | 0 | ... |
| ,, | | Boston | 1·20 | — 1·10 | ·39 | 27 | 11 | 85·0 | 20 | 45·0 | 13 | 0 | ... |
| ,, | | Grimsby (Killingholme) | ·65 | .. | ·33 | 29 | 11 | 80·5 | 18 | 45·0 | 4 | 0 | ... |
| ,, | | Mansfield | 1·08 | ... | ·40 | 27 | 9 | 83·2 | 19 | 41·9 | 4 | 0 | 0 |
| VIII. | | Manchester (Ardwick) | 1·28 | — 1·25 | ·36 | 24 | 9 | 88·0 | 21 | 50·0 | 13 | 0 | ... |
| IX. | | York | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 2·25 | — ·98 | ·80 | 25 | 12 | 93·0 | 22 | 42·0 | 12 | 0 | ... |
| X. | | North Shields | ·13 | — 1·68 | ·04 | 6, 28 | 7 | 80·0 | 18 | 47·0 | 3 | 0 | ... |
| ,, | | Borrowdale (Seathwaite) | 3·11 | — 5·03 | 1·60 | 5 | 8 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Crockherbtown) | 2·01 | ... | ·78 | 23 | 9 | 84·6 | 21 | 48·0 | 28 | 0 | ... |
| ,, | | Haverfordwest | 4·80 | + 1·50 | 2·86 | 19 | 9 | 84·3 | 19 | 46·0 | 27‖ | 0 | ... |
| ,, | | Aberdovey | 1·41 | ... | ·58 | 24 | 11 | 92·0 | 20† | 48·0 | 13 | 0 | ... |
| ,, | | Llandudno | 1·19 | — 1·10 | 1·05 | 24 | 4 | 13·6 | 23 | 46·9 | 13 | 0 | ... |
| XII. | SCOTLAND. | Dumfries (Crichton Asylum) | ·47 | — 2·06 | ·27 | 6 | 3 | 85·5 | 22 | 42·5 | 31 | 0 | ... |
| ,, | | Hawick (Silverbut Hall) | ·84 | ... | ·37 | 26 | 7 | ... | ... | ... | ... | ... | ... |
| XIV. | | Glasgow (Cessnock Park) | ·45 | ... | ... | ... | ... | 70·0 | ... | 40·0 | ... | 0 | ... |
| XVI. | | Mull (Quinish) | 1·74 | ... | ·57 | 5 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | .. |
| ,, | | Tyndrum (Ewick) | ... | ... | ... | ... | ... | .. | ... | ... | ... | ... | ... |
| ,, | | Arbroath | ·73 | — 1·82 | ·26 | 11 | 7 | 84·0 | 18 | 45·0 | 2 | 0 | ... |
| XVII. | | Braemar | ·43 | — 1·85 | ·12 | 7 | 7 | 81·5 | 21 | 38·4 | 4 | 0 | ... |
| ,, | | Aberdeen | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XVIII | | Gairloch | 3·20 | ... | ·71 | 5 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Portree | 2·54 | — 3·53 | ·59 | 4 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·59 | — 1·08 | .. | ... | 11 | 74·7 | 21 | 45·0 | 4 | 0 | 0 |
| XIX. | | Dunrobin | 1·27 | — ·48 | ·65 | 4 | 10 | 74·5 | 16 | 41·0 | 4 | 0 | ... |
| ,, | | Sandwick | 2·52 | + ·63 | 1·15 | 5 | 12 | 65·1 | 31 | 46·3 | 3 | 0 | 0 |
| XX. | IRELAND. | Caherciveen Darrynane Abbey | 2·43 | ... | ·60 | 27 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Cork | 1·51 | ... | ·50 | 26 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | ·88 | — 2·44 | ·50 | 12 | 2 | ... | ... | ... | ... | ... | ... |
| ,, | | Killaloe | 1·42 | — 1·77 | ·35 | 23 | 8 | 90·0 | 23 | 44·0 | 5 | 0 | ... |
| XXI. | | Portarlington | 1·27 | — 2·27 | ·77 | 23 | 16 | 80·5 | 20 | 45·0 | 28 | 0 | ... |
| ,, | | Monkstown, Dublin | ·55 | — 1·88 | ·23 | 26 | 6 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 1·43 | .. | ·66 | 23 | 9 | 85·0 | 23 | 48·0 | 4, 25 | 0 | ... |
| XXIII | | Waringstown | ·51 | ... | ·38 | 24 | 4 | 84·0 | 22 | 44·0 | 12 | 0 | ... |
| ,, | | Edenfel (Omagh) | ·37 | ... | ·09 | 9 | 10 | 81·0 | 22‡ | 39·0 | 29 | 0 | ... |
| ,, | | Ballyshannon | 2·04 | ... | 1·37 | 23 | 7 | ... | .. | ... | ... | ... | ... |

* And 21. † And 21, 22. ‡ And 23. ‖ And 28. § And 20, 21.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

SELBORNE.—A growing month, very promising for the harvest; all the cereal crops in fine condition; hops doubtful. T on the 22nd, 23rd and 24th.

BANBURY.—Wheat much beaten down by the R of the 24th; a little cut at the end of the month. T S on the 24th and 26th.

CULFORD.—An almost entire absence of R was experienced here during the first three weeks of the month, the total rainfall of which was less than three quarters of an inch (·69 in.); fortunately, however, many days were overcast and sunless. A few very warm days followed the 17th, the max. temperature occurring on the 19th; the mean temperature was 61°·4, and easterly winds prevailed during only 5 days. T S on 24th.

BODMIN.—Mean temp. of the month (67°·6) considerably above the average.

SHIFNALL.—The hot weather with which the last month ended continued at the beginning of this, producing real dog days up to the 24th, when it was broken up by a severe TS with a heavy downfall of R (1·07 in.) commencing at 5 p.m., and lasting all night, lowering the temperature from 72° to 65°. The storm only cleared the air for further heat, tempered however by a pleasant breeze on most days from E. and N.E. Hay crop abundant and well got in; grain crops vastly improved. Scarcely a butterfly, not even a white one, seen since May till the 24th of this month.

TENBURY.—The temperature was generally rather low, with much cloud till the 15th, when the weather became very fine, hot and dry, and continued so till noon on the 22nd, when the first heavy R occurred with T and L. On the 24th distant T commenced at 3 p.m., becoming louder with heavy R at 4.15 p.m.; frequent showers fell till 9 p.m., and then very heavy R at intervals till 8 a.m. on 25th, by which time 1·47 in. had fallen in about 18 hours; after the 26th the weather was fine, dry and warm to the end of the month. The mean temp. was about 1° above the average of the month, and the weather was very favourable for the hay harvest and the ripening of the corn.

LEICESTER.—T on the 23rd and 24th; TS on the 25th, between 6 and 7 p.m.

BOSTON.—The long spell of dry weather, which lasted from the beginning of June, broke up on the 22nd, and for the next week we had constant showers, which were most beneficial to the newly-sown turnip, raddish, and mangold crops. Some of the heaviest wheat crops have been beaten down by the rain, but generally the corn is standing well up, and there is every prospect of a good harvest; reaping will begin generally in about a week or ten days.

GRIMSBY.—A fine summer month, warmer than the average, and some days very hot; but rain, which fell abundantly at times around us, was much wanted here. End of month cloudy, T and L on 24th and 25th, T on 28th.

MANSFIELD.—TS on the 24th, at 4 p.m., and also on the 27th, at 4 p.m.

ARNCLIFFE.—A higher temperature and less rainfall have never been registered at this station in July. Hay harvest abundant and well secured.

NORTH SHIELDS.—A very fine month, with scarcely any R.

SEATHWAITE.—Rainfall not half the average. T and L on 21st.

## WALES.

HAVERFORDWEST.—A splendid month with high temperature, large amount of sunlight and plentiful R at intervals. Magnificent hay crop and splendid promise of a good cereal harvest. On the evening of the 19th one of the severest storms took place that I ever remember; the heat had been intense for several days, and especially so in the early part of this month. T was heard in a south-easterly direction about 5 p.m.; large masses of cumuli of a dark and lurid colour occupied the easterly horizon; the air was sultry in the extreme; at 10 p.m. vivid flashes of sheet L occurred incessantly, but it was not till near midnight that the first mutterings of the great storm were heard; the T became louder, the L flashed without a moment's pause, every variety of form and colour of flash, pale rose, steel blue, intense white, some zigzag, some spiral;

the noise of the T was very awful, the peculiar sound as of air rushing in to fill up a vast vacuum being very suggestive and dreadful. R commenced about 1 a.m. and continued with but little intermission till about 4.30 a.m., the amount up to that time being 2.86 in. In the lower parts of the town the basements of the houses were flooded, and great damage was done to property; the vane of St. Thomas's church was struck, and a hole made through the groined roof of the tower; the belfry of another church was also struck, several houses were shattered, telegraph posts split to pieces, a cow and a horse killed, and other cattle killed or injured in the surrounding district, fine trees split from the top to the roots, haystack fired, and one man killed.

ABERDOVEY.—A very dry, hot month; with two or three days' exception, generally calm and cloudless, wind ranging from N.W. to E. T and L on 20th, accompanied by hailstones as large as pigeons' eggs. Splendid harvest weather.

LLANDUDNO.—A month of splendid weather, the mean temp. being half a degree above, and the rainfall about one inch below the average. Hay harvest most abundant, concluded before the end of the month, and the grain harvest begun. A fine seasonable R on 24th, fully 1 in. in 24 hours. T on 24th at 2 p.m.

## SCOTLAND.

DUMFRIES.—The rainfall for July is the lowest every recorded at this station, and the mean temp. is exceptionally high; the winds have been very light, and chiefly from N.E. and N.W. Neither T nor L have been recorded, which is very unusual considering the extreme heat.

HAWICK.—The finest July seen here for many years. Hay crop secured in splendid condition. Pastures are now much parched, and will take a good deal of R to moisten them properly. T on 19th and 23rd.

QUINISH.—Broken showery weather from 5th to 11th inclusive. A slight R continuously from 16th to 21st, the rest of the month very fine and hot.

ARBROATH.—The max. temp. in the shade, 84°, is the highest temp. registered at Arbroath for at least thirty-five years.

BRAEMAR.—A very dry month; temp. considerably above the average, crops and pastures suffering much in consequence.

PORTREE.—A fine month, the rainfall much under the average; from the 18th very warm, with bright sun. Potatoe blight is making its appearance.

INVERNESS.—T about 2 p.m. on the 25th.

DUNROBIN.—This month on the whole has been dry and fine. Vegetation began to suffer for want of R by the close of the month; pastures and crops on some light lands suffered severely.

SANDWICK.—July has been a fine month, R rather above the average, but nearly four-fifths of it (1·90 in.) fell on the 4th, 5th, and 6th; it has also been warm and very favourable for the crops, particularly for haymaking.

## IRELAND.

DARRYNANE ABBEY.—The first month of real summer that we have had: heavy but distant T on the 20th and again on the 21st with some L. This latter storm was very heavy at Waterville and Ballinskelligs, 5 to 8 miles to N.W., and accompanied by heavy R.

KILLALOE.—An extraordinary fine month with most beneficial results in every agricultural department, particularly haymaking, one of the finest crops ever made in Ireland being now secured. Potatoe crops also much improved.

MONKSTOWN.—One of the driest and warmest Julys for many years.

EDENFEL, OMAGH.—A most seasonable month; the third week hotter than any corresponding period since 1868; crops of all kinds most luxuriant.

BALLYSHANNON.—The month has been one of unusual heat. On the 23rd, at 6 p.m., a severe TS with frequent L broke over this town and neighbourhood, the R fell in torrents, and from 6.30 p.m. to 7.20 p.m. the rainfall was ·60 in., and up to 9 a.m. on the following morning the total amount was 1·37 in. This storm was in a great degree local, as in a town 11 miles to the N. it was not felt, nor in a neighbouring county. All crops are good, and the potatoes, though not free from blight, promise abundantly.